PATENT SPECIFICATION (11) 1391201

1391201

(21) Application No. 20962/72 (22) Filed 5 May 1972

(31) Convention Application No. 2125496 (32) Filed 22 May 1971 in

(33) Germany (DT)

(44) Complete Specification published 16 April 1975

(51) INT CL² B65G 47/24 15/14

(52) Index at acceptance

B8A 1H7 1R

(19)

(54) KNOT ADJUSTING ARRANGEMENT FOR A COIL SPRING FEED APPARATUS

(71) We, SPÜHL AG., a Swiss Body Corporate, of 18 Lukasstrasse, St. Gallen 9009, Switzerland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a knot-adjusting arrangement for use with apparatus for feeding an array of coil springs, for example, to a machine for manufacturing spring mattresses and has particular application to feeding apparatus having two parallel endless belts between which the springs are clamped and advanced in a stepwise manner. In one feeding apparatus, coil springs are successively removed from the output of a spring coiling machine, by means of a removing arm, and placed between the parallel endless belts. By virtue of a special construction of the known removing arms each *n*th spring is turned through 180° before it is inserted between the belts and when a sufficient number of springs are located between the belts, a group of *n* springs are commonly transferred by means of a gripper mechanism into the machine for manufacturing the spring assemblies. The purpose of turning the *n*th spring is to bring the knot of the end coil of the array of springs into an extreme rearward position, while the knots of the end coils of all the other springs are located in an extreme forward position. Thus, in an array of *n* springs the knots of the two end coil springs are inwardly of the array.

The known spring turning arrangements suffer from the faults which occur in operating the removing arm at high operating speeds.

The object of the invention is to provide a knot-adjusting arrangement for a coil spring feed apparatus.

According to the present invention there is provided a knot adjusting arrangement for apparatus for feeding an array of helical wire springs, the feed apparatus including two parallel endless belts between which the springs are clamped and advanced in a stepwise manner, said knot adjusting arrangement comprising three turning mechanisms through which each spring is successively passed, and wherein each turning mechanism comprises a stop engageable with a spring located at the mechanism and a turning bar for rotating said spring, the turning bar of the first turning mechanism being arranged to selectively effect one or other of two strokes so as to locate the knots of selected springs in a first position relative to the belts and the knots of other springs in a second position relative to the belts, the second and third turning mechanisms being effective to rotate the knots of springs displaced to the second position by said first mechanism until said knots lie substantially opposite to the knots of springs moved only to said first position.

The invention will now be described by way of example with reference to the accompanying drawings, in which:—

Fig. 1 shows a diagrammatic plan view of two endless belts for conveying wire springs;

Fig. 2 shows a diagrammatic view of the desired position of the knots of the end coils of a succession of springs immediately before they are transferred into a machine for manufacturing spring mattresses;

Fig. 3 is a diagram showing the mode of operation of the knot-adjusting device;

Fig. 4 is a view of the second turning mechanism;

Fig. 5 is a section taken on the line V—V in Fig. 4;

Fig. 6 is a plan view seen in the direction of the arrow VI in Fig. 4, some of the parts being omitted; and

Figs. 7 and 8 are each a view, corresponding to Fig. 4, of the relevant mechanism in different working phases.

Fig. 1 shows two parallel endless belts 1 guided around vertical-axis guide pulleys 2, with a plurality of helical wire springs 3 clamped between the adjacent parallel runs of the belts 1. A loading arm 5, pivotable about a horizontal axle 4, is mounted below

the endless belts 1 at the input end thereof and carries a gripper element 6 which serves to feed wire springs 3 from a spring manufacturing apparatus (not illustrated) successively into the initial spring position 3_1 between the belts 1. The springs 3 are coiled wire springs having their ends wrapped around the coils adjacent thereto (as shown in Figs. 4, 7 and 8). These coiled ends are defined as "knots" in this specification.

The belts 1 are driven in a stepwise manner by two of the guide pulleys 2, a spring 3 being delivered by arm 5 into the position 3_1 after each step, so that for example ten springs 3 are finally located between the belts 1. The foremost eight springs 3, are then simultaneously gripped by a gripper mechanism (not shown) and transferred to a machine for manufacturing spring assemblies. Fig. 2 is a view of the desired position of the knots 7 of the end coils 8 of the eight foremost springs abutting against one of the belts 1, and the end coils 8 being diagrammatically illustrated by circles and the knots 7 by large dots. It will be seen that all the knots 7 are located in the horizontal central plane m—m of the belts 1, the knots of the first seven end coils 8, counted from the left in Fig. 2, being located in the extreme "forward position" 7_o while the knot of the eighth end coil 8n is in the extreme "rearward position" 7_n. The reason for this is that knots 7 should not be located on the periphery of the finished spring construction in order to avoid damage to covers or the like.

To obtain the special position of the end coil 8_n it was hitherto the practice to arrange the gripper device 6 so as to be pivotable about the longitudinal direction of the arm 5, a device being provided to pivot the gripper device through 180° during the insertion of each *n*th spring, for example each 8th spring. The precision with which the knots 7 were brought by the removing arm 5 into the desired position shown in Fig. 2 is often unsatisfactory, because for example of the difficulty in operating the device required for pivoting the gripper element 6 through 180° at the correct instant and the risk of faults increasing as the operating speed increases.

The pivotability of the gripper element 6 to rotate the *n*th spring has been dispensed with in the the present knot-adjusting device.

Referring now to Fig. 3, the present knot-adjusting device includes three turning mechanisms 9, 10 and 11 provided along the belt 1 at three successive stations at which the springs 3 are stopped between successive displacement steps.

The first turning mechanism 9 (Fig. 3) comprises an aligning device having a pusher 12 which, after each step of the belts 1, is moved in such a manner that it advances its working edge 13 against a knot 7 of an end coil 8 located in the position 7_1. During *n*—1 successive working cycles, the pusher 12 moves in the direction of the arrow only to an extent where the knot 7_1 is pushed into the position 7_o, this being effected by a stop 14 which, for the sake of clarity, is shown in Fig. 3 in the path of the working edge 13. A fixed, horizontal stop 15 prevents displacement of the end coil 8 of the spring in the direction of advance of pusher 12. At each *n*th working cycle of the pusher 12, the stop 14 is moved out of the path of the pusher 12, so that the knot 7_1 assumes the position 7_2, i.e. it is turned through almost 90° further than the knots of the other springs.

After the next displacement movement of the belts 1 the springs leaving station 9 are located at the second turning mechanism 10 which has a stop 16 and a turning bar 17 which may be moved from their inoperative positions, 16_i and 17_i shown by broken lines, into their operative positions shown by solid lines in order to bring the knot 7_2 of the *n*th spring into the position 7_3.

The third turning mechanism 11, located at the stopping location succeeding station 10, again comprises an aligning mechanism having a pusher 12′ having a working edge 13′, a stop 14′ and a stop 15′; the third turning mechanism differs from the turning mechanism 9 only in that the stop 14′ does not need to be removed from the path of the pusher 12′, and operates only once during *n* working cycles of the turning mechanism 9 to bring the knot 7_3 into the position 7_4, i.e. into the central plane m—m in the position turned through 180° relative to 7_o. When the relevant spring 8n has then reached the foremost position, the knot 7_4 is located in the position 7n shown in Fig. 2.

It has transpired that the second turning mechanism 10, whose construction and mode of operation will be further described with reference to Figs. 4 to 8, operates substantially more reliably and more rapidly than the turning device previously used for the gripper element 6, so that, in conjunction with the aligning devices 9 and 11, a considerable advance is achieved.

Referring to Figs. 4 to 6, the second turning mechanism 10 has an angular support 18 whose two limbs are designated 19 and 20. The top of the limb 20 of the support has a slightly angled extension 20′ which is secured by means of screws 21 and spacers 22 to the frame whose portions shown in the drawing are designated 23. Two bearing blocks 25 (omitted in Fig. 4) are secured to the limb 20 by means of screws 24 and carry two aligned guide bearings 26 for the stop 16 which has a rectangular cross section and, on its top wedge-shaped end 27, a vertical wedge surface 28. When the stop 16 is in its illustrated working position, the wedge surface 28 is in contact with the inside of the relevant belt 1 and immediately behind the end coil 8 of the

spring 3 whose knot is located in the position 7_2 in Fig. 3.

In order to reciprocate the stop 16, the stop 16 is hinged to the top end of a pivoted lever 31 by means of a pin 29 which engages into a slotted hole 30 in the pivoted lever. The lever 31 is pivotally mounted on a projecting portion 19' of the limb 19 of the support by means of a screw 32 and a spacer 33, the bottom end 34 of the lever 31 being located between two stops 35 and 36 on a head 38 provided at the free end of a piston rod 37. The head 38 is guided between two parallel guides 39 secured to the limb 19 of the support and, when in its illustrated working position, abuts against a rubber buffer 40 screwed to an angled member 41 secured to the support. The piston (not visible) of the piston rod 37 is located in a double-acting pneumatic cylinder 42 screwed to an angled member 43 secured to the support. It may be seen that stop 16 assumes its ready position 16_1 (shown by a dash-dot line) when the piston rod 37 is drawn into the cylinder 42.

A rectangular mounting plate 46, provided with two elongate slots 47 in its central line, is located in a vertical plane parallel to the belt 1 and has a projection 46' secured to the frame 23 by means of screws 44 and spacers 45. Two guide members 48 engage through the slots 47 and are secured to a reciprocable member 50 by means of screws 49. An angled end 51 of the member 50 is screwed to a piston rod 52 whose piston is located in a double-acting pneumatic cylinder 53. The cylinder is secured to an angled member 54 which is bolted to the mounting plate 46 and on which are provided two rubber buffers 55 one on each side of the piston rod 52. The other end 56 of the member 50 is also angled and is located opposite a central rubber buffer 57 secured to an angled member 58 which is bolted to the mounting plate 46.

An arm 61 is pivotally mounted on the member 50 by means of a screw 59 and a spacer 60, a tension spring 62 being hooked to the free end of the arm 61 to pull the arm towards a pin 63 secured to the member 50. The turning bar 17 directed radially and at right angles to the arm 61 is secured to the latter. A parallelepiped stop block 64 has an elongate slot 65 through which pass two screws 66 by which the block 64 is adjustably secured to the mounting plate 46. Two guide pins 67 are secured to the mounting plate 46 below the block 64 in order to render the play of the screws 66 in the slot 65 ineffective when adjusting the block 64.

Fig. 7 shows the turning mechanism 10 in a position in which the reciprocable member 50 is located in its extreme right hand position, the angled end 56 of the member 50 abutting against the buffer 57 and the turning bar 17 still being located in the ready position designated 17_1 in Fig. 3, while the stop 16 has already been displaced into its working position by means of the pivoted lever 31 by appropriate control of the compressed air fed to the cylinder 42. When in the ready position, the turning bar 17 is substantially in alignment with the member 50, while the arm 61 abuts against the end face (designated 68 in Fig. 7) of the stop block 64 under the action of the spring 62. If the member 50 is now pulled to the left by the piston rod 52, the arm 61 slides on the edge 69 of the block 64, whereby the arm 61 and thus the bar 17 are pivoted in the direction of the arrow 70. Figs. 4 to 6 correspond to the instant at which, as a result of this pivoting, the bar 17 engages the knot of the end coil 8 located in position 7_2 and thus commences to rotate the spring to turn the knot towards the rear, while the stop 16 prevents the end coil 8 from movement other than rotational. During further movement of the member 50 towards the left, the arm 61 finally comes into abutment against the side face (designated 71 in Fig. 8) of the block 64 and the turning bar 17 has completed its work, i.e. the bar 17 has brought the knot into the position 7_3. It will be seen from Fig. 8 that the ideal centre line of the spring 62 is still somewhat below the ideal axis of rotation of the arm 61 even when the turning bar 17 is in this outermost working position, so that, at the next movement of the member 50 towards the right, the spring 62 will pivot the arm 61 in the opposite direction to the arrow 70 and thus return the bar 17 into its ready position shown in Fig. 7.

Before the belts 1 are again advanced by one step, compressed air is admitted to the cylinder 42 in such a manner that the piston head 38 moves upwardly and thus pivots the lever 31 in the direction of the arrow 72 in Fig. 5, whereby the stop 16 is moved into its ready position 16_1 in which it does not obstruct the forward movement of the next spring 3 during the step now following. The position 16_1 is defined by the striking of the lever 31 against a rubber buffer 73 secured to the lower bearing block 25.

The inner portions of the two belts 1 clamping the spring 3 are also illustrated in Fig. 5. If the present knot-adjusting devices are applied successively to one of the springs they suffice to turn only one knot (of each spring) from the position 7_2 rearwardly into the position 7_3, the entire spring participates in this movement, and the knot at the oppositely located end coil 8 assuming a position which, although it does not correspond exactly to the position 7_3, corresponds thereto with good approximation. Preferably therefore two oppositely located turning mechanisms 9 and two oppositely located turning mechansms 11 and provided, together with a single turning mechanism 10_8 since the two end coils 8 of

the relevant springs 3 are required accurately to reach the knot position 7_0 and 7_4 respectively. It will be appreciated that, in principle, it is possible to provide two turning mechanisms 10, although it will generally not be worthwhile to incur the necessary expenditure.

It may be mentioned that the desired position of the knots 7, illustrated in Fig. 2, is not essential, it being important only to maintain the knot positions 7_0 and 7_n in the case of the first and the last springs. The springs located between the end springs may have their knots located in position 7_n instead of in position 7_0, although it is obviously the simplest arrangement if the second and the third turning mechanisms 10 and 11 each have to operate with only one of n springs instead of with a plurality or even n—1 springs. The first turning mechanism must of course operate with each spring, either until the relevant knot has entered the position 7_0 from the position 7_1 or until it has assumed the position 7_2. It will be appreciated that the mechanism 9 may be arranged below the belts 1 and the mechanisms 10 and 77 above the belts 1, according to the position of the knot on the end coil at the output of the spring coiling machine.

WHAT WE CLAIM IS:—

1. A knot adjusting arrangement for apparatus for feeding an array of helical wire springs, the feed apparatus including two parallel endless belts between which the springs are clamped and advanced in a stepwise manner, said knot adjusting arrangement comprising three turning mechanisms through which each spring is successively passed, and wherein each turning mechanism comprises a stop engageable with a spring located at the mechanism and a turning bar for rotating said spring, the turning bar of the first turning mechanism is arranged to selectively effect one or the other of two strokes so as to locate the knots of selected springs in a first position relative to the belts and the knots of other springs in a second position relative to the belts, the second and third turning mechanisms being effective to rotate the knots of springs displaced to the second position by said first mechanism until said knots lie substantially opposite to the knots of springs moved only to said first position.

2. A knot adjusting arrangement as claimed in claim 1, in which the stop of the second turning mechanism is mounted so as to be displaceable in its longitudinal direction and is actuated by way of a pivotable lever by means of a double-acting pneumatic cylinder fixed relative to the frame.

3. A knot adjusting arrangement as claimed in claim 2, in which the stop of the second turning mechanism has a wedge surface which abuts against the adjacent endless belt when said stop is in a working position.

4. A knot adjusting arrangement as claimed in claim 1, 2 or 3 in which the turning bar of the second turning mechanism is pivotally mounted on a reciprocable member, said turning bar being displaceable towards the belt and being rigidly secured to an arm which slides on a stop block during displacement of the reciprocable member.

5. A knot adjusting arrangement as claimed in claim 4 in which displacement of said reciprocable member is effected by means of a double-acting pneumatic cylinder fixed relative to the frame and the turning bar is pivoted, against the action of a spring, from a ready position to an end position, thus to turn a knot from the second position into a third position relative to the belts.

6. A knot adjusting arrangement as claimed in claim 4 or 5 in which the stop block is adjustable and a parallelepiped and the arm abuts against an end face of the stop block when in the ready position and against a side face thereof when in the end position, and slides on an edge of the stop block when between these positions.

7. A knot adjusting arrangement as claimed in any preceding claim in which the turning bar of the first turning mechanism turns the knot of each nth spring, in a preselected pattern, into a second position, n representing the number of springs in one group or array of springs which are to be transferred commonly from the belts to a machine for manufacturing spring mattresses.

8. A knot adjusting arrangement as claimed in any of claims 1 to 7, in which said first, second and third turning mechanisms are associated with one of said belts, two further turning mechanisms being associated with the other belt, the two further turning mechanisms being located opposite respective ones of the first and third turning mechanisms.

9. A knot adjusting arrangement substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

W. P. THOMPSON & CO.,
Coopers Building, Church Street,
Liverpool, L1 3AB.
Chartered Patent Agents.

Printed for Her Majesty's Stationery Office, by the Courier Press, Leamington Spa, 1975.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

Fig.1

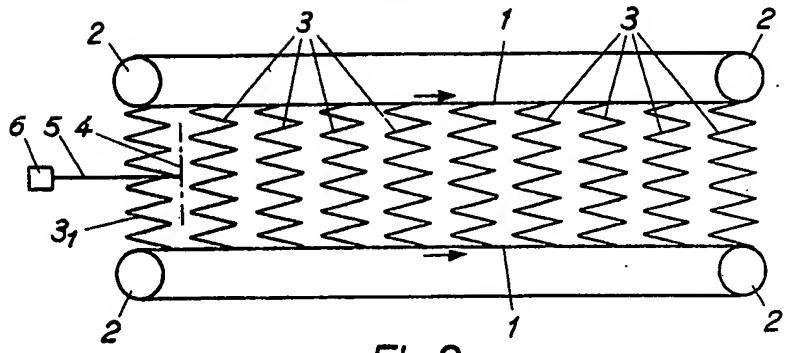


Fig.2

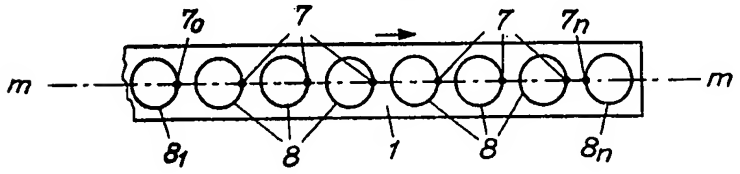


Fig.3

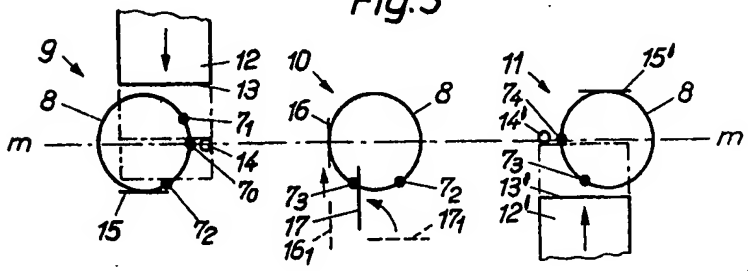


Fig.6

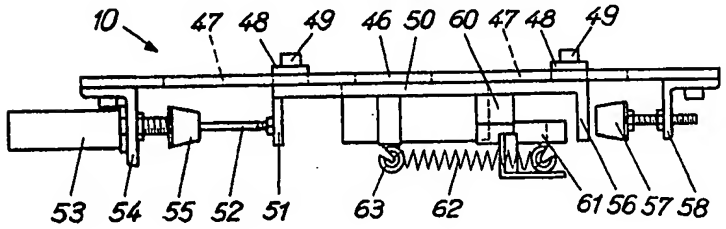


Fig. 4

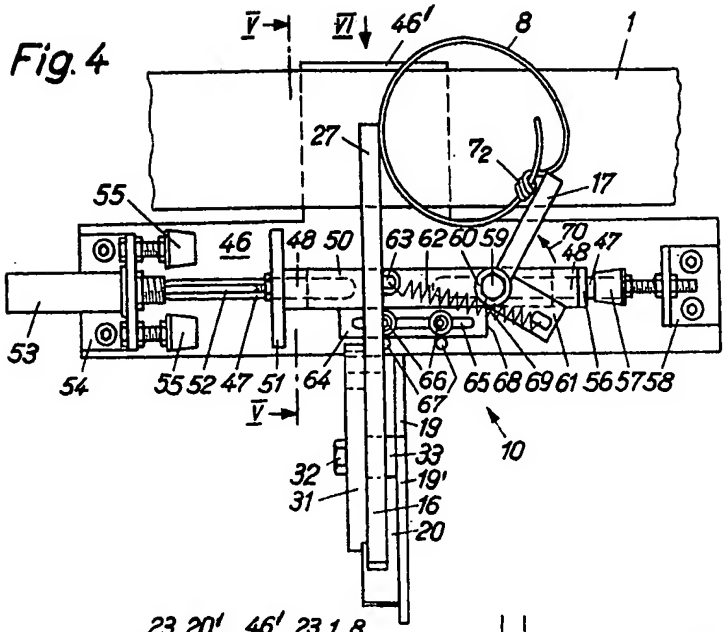

V
VI
46'
8
1
27
72
17
55
46
48
50
63
62
60
59
70
48
47
53
54
55
52
47
51
64
66
65
68
69
61
56
57
58
V
67
19
10
33
19'
32
31
16
20

Fig. 5

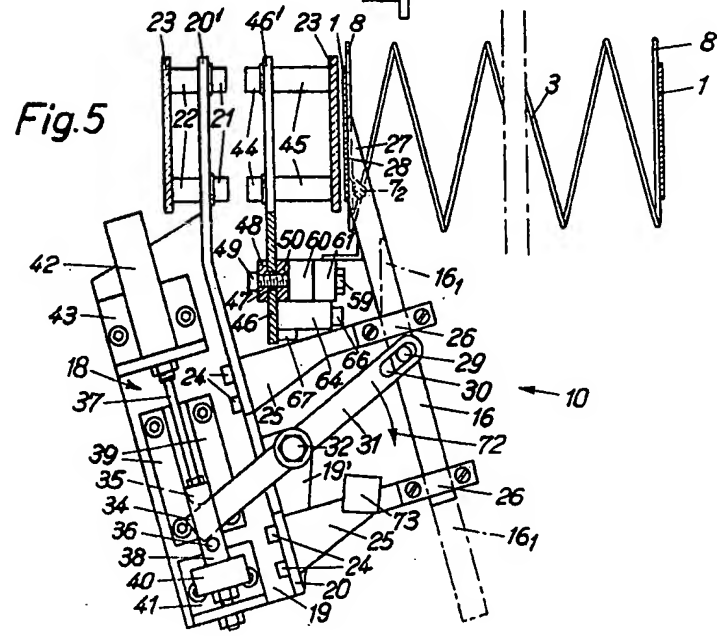

23
20'
46'
23
1
8
8
1
3
22
21
44
45
27
28
72
48
49
50
60
61
16₁
42
47
59
43
46
26
18
66
29
24
64
30
10
37
25
67
16
72
32
31
39
19'
35
26
34
73
36
25
16₁
38
24
40
20
41
19

Fig.7

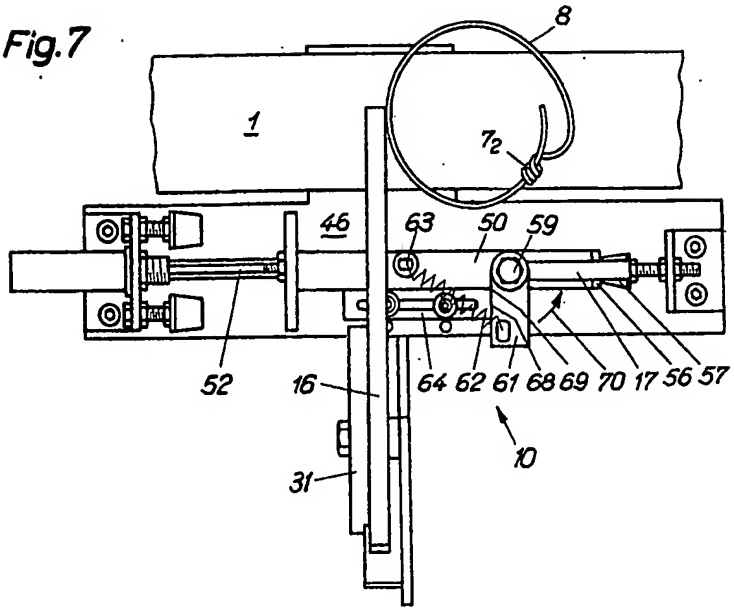
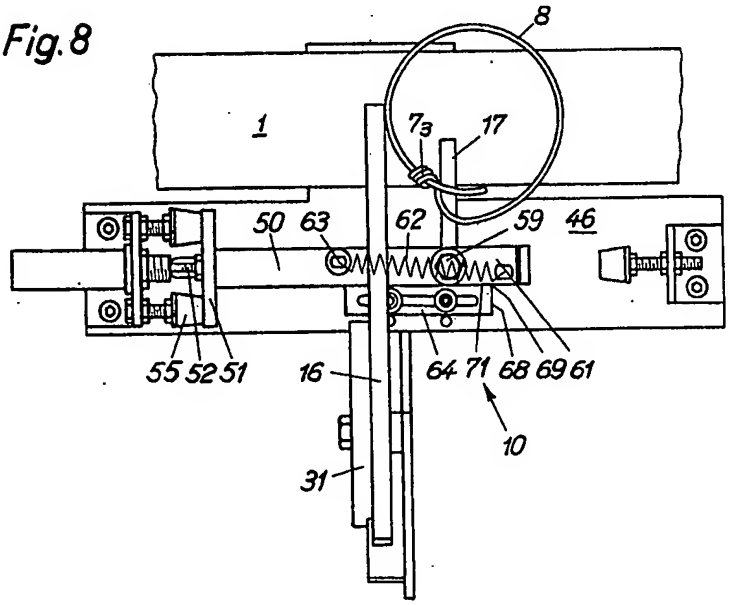

8
1
7₂
46
63
50
59
52
16
64
62
61
68
69
70
17
56
57
10
31

Fig.8


8
1
7₃
17
50
63
62
59
46
55
52
51
16
64
71
68
69
61
10
31